Discrete Event Simulation Model of a Congested Segment of the Upper Mississippi River Inland Navigation System

Start Date: Jul 2003

Projected End Date: Nov 2004

POC:

POC

Problem Addressed:

This study presents a simulation model that differs from prior waterways simulation models in two important dimensions. First, the simulation model developed explicitly embodies the fact that the Upper Mississippi River (UMR) system never achieves a steady state level of system performance. Therefore, the steady state queuing system models used to approximate the operating conditions of the UMR employed in Corps of Engineers system economic models may distort the evaluation of potential changes to the operating conditions or infrastructure of the system. Second, this UMR navigation system simulation model explicitly incorporates the fact that the production of water transportation movements cannot be independent of each other as the waterway transportation equipment needed to complete each movement must first be delivered to the origin of the movement from some other waterway location. Therefore, system performance characteristics such as queue sizes and transit times at system locks will be interrelated and modeling these locks as a series of independent servers is not appropriate.

Objective:

The purpose of this research is to create a discrete event-based simulation tool for use in investigating changes to the operational characteristics of an important segment of the inland navigation transportation system. The lower five 600-foot long locks of the UMR navigation system provide a useful setting for testing such a simulation model as these five locks experience periodic traffic congestion, are subject to seasonal changes in demands for service, and operate as a system in that they share a large amount of common interrelated commercial tow traffic.

Benefits:

The interdependency of lock operations created by the service of common tow traffic and the existence of periods of high and low levels of demand for use of the system provide currently untapped sources of efficiency improvements for the implementation of alternative traffic management policies in the operation of the UMR system. Specifically, system efficiencies can be created by scheduling traffic, re-sequencing vessels for processing at the locks or by providing economic incentives for decreasing system use during high demand periods and increasing system use during low demand periods. Existing system economic models used by the Corps of Engineers cannot properly evaluate these potential operational improvements.

Status:

Completed.

Contract Data:

IWR 2003

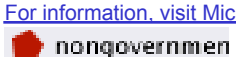
Progress:

Products (Bookshelf/Toolbox):

Report by Donald Sweeney, November 2004 *(1.4 MB, pdf)*

UMR Simulation Model *(8 KB, zip)*

Micro Saint software required to operate model. For information, visit Micro Saint's web site *(html)*



Map of UMR Locks *(1.8 MB, bmp)*

Related Links:

Navigation Economic Technologies

Center for Transportation Studies

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